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*Certificate*

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the documents annexed hereto are true copies of:

Application forms P.1 and P.3, provisional specification and drawings of  
South African Patent Application No. 2003/7748 as originally filed in the  
Republic of South Africa on 3 October 2003 in the name of INTERNATIONAL  
TECHNOLOGIES, LLC for an invention entitled: "BLASTING".

**PRIORITY  
DOCUMENT**  
SUBMITTED OR TRANSMITTED IN  
COMPLIANCE WITH RULE 17.1(a) OR (b)

Geteken te

PRETORIA

signed at

in die Republiek van Suid-Afrika, hierdie

in the Republic of South Africa, this

8

dag van

November 2004

day of

Registrar of Patents

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PATENT APPLICATION NO		
21	01	

A&A Ref: SCF/cve  
V15964

LODGING DATE	
22	3 October 2003

FULL NAME(S) OF APPLICANT(S)	
71	INTERNATIONAL TECHNOLOGIES, LLC

FULL NAME(S) OF INVENTOR(S)	
72	HEINKE, Nils Alberto SKAGGS, Roger Dean COLLINSWORTH, Stephen Mitchell

EARLIEST PRIORITY CLAIMED	COUNTRY	NUMBER	DATE
	33	31	32

NOTE: The country must be indicated by its International Abbreviation - see schedule 4 of the Regulations

TITLE OF INVENTION	
54	BLASTING

\* I/We HEINKE, Nils Alberto

hereby declare that :-

1. ~~I/we am/are the applicant(s) mentioned above;~~
- \*\* 2. I/we have been authorized by the applicant(s) to make this declaration and have knowledge of the facts herein of the applicant(s); stated in the capacity of President
- \*\*\* 3. the inventor(s) of the abovementioned invention is/are the person(s) named above and the applicant(s) has/have acquired the right to apply by virtue of an assignment from the inventor(s);
4. to the best of my/our knowledge and belief, if a patent is granted on the application, there will be no lawful ground for the revocation of the patent;
- \*\*\*\* 5. ~~this is a convention application and the earliest application from which priority is claimed as set out above is the first application in a convention country in respect of the invention claimed in any of the claims; and~~
6. the partners and qualified staff of the firm of ADAMS & ADAMS, patent attorneys, are authorised, jointly and severally, with powers of substitution and revocation, to represent the applicant(s) in this application and to be the address for service of the applicant(s) while the application is pending and after a patent has been granted on the application.

SIGNED THIS 30 DAY OF September

2003

*Nils Alberto Heinke*

Company Name: INTERNATIONAL TECHNOLOGIES, LLC

Full Names: HEINKE, Nils Alberto

Capacity: President

(no legalization necessary)

- \* In the case of application in the name of a company, partnership or firm, give full names of signatory/signatories, delete paragraph 1, and enter capacity of each signatory in paragraph 2.
- \*\* If the applicant is a natural person, delete paragraph 2.
- \*\*\* If the right to apply is not by virtue of an assignment from the inventor(s), delete "an assignment from the inventor(s)" and give details of acquisition of right.
- \*\*\*\* For non-convention applications, delete paragraph 5.

REPUBLIC OF SOUTH AFRICA  
PATENTS ACT, 1978  
APPLICATION FOR A PATENT AND  
ACKNOWLEDGEMENT OF RECEIPT  
(Section 30(1) Regulation 22)

REPUBLIC OF SOUTH AFRICA	
FORM P.1	REVENUE
(to be lodged in duplicate)	
03.10.03	R 060.00
HASH 370	
INKOMSTE	
A&A REPLY/16084/03/10/03	

THE GRANT OF A PATENT IS HEREBY REQUESTED BY THE UNDERMENTIONED APPLICANT  
ON THE BASIS OF THE PRESENT APPLICATION FILED IN DUPLICATE

21 01 PATENT APPLICATION NO. 2003/7748

71 FULL NAME(S) OF APPLICANT(S)

INTERNATIONAL TECHNOLOGIES, LLC.

ADDRESS(ES) OF APPLICANT(S)

Route 1, Box 328-50, Elkins, WV 26241, United States of America

54 TITLE OF INVENTION

**BLASTING**

Only the items marked with an "X" in the blocks below are applicable.

☐ THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. The earliest priority claimed is

Country:

No:

Date:

☐ THE APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO

21 01

☐ THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND BASED ON  
APPLICATION NO

21 01

**HIS APPLICATION IS ACCOMPANIED BY:**

☒ A single copy of a provisional specification of 9 pages

☒ Drawings of 1 sheets

☐ Publication particulars and abstract (Form P.8 in duplicate) (for complete only)

☐ A copy of Figure of the drawings (if any) for the abstract (for complete only)

☐ An assignment of invention

☐ Certified priority document(s). (State quantity)

☐ Translation of the priority document(s)

☐ An assignment of priority rights

☐ A copy of Form P.2 and the specification of RSA Patent Application No

21 01

☒ Form P.2 in duplicate

☐ A declaration and power of attorney on Form P.3

☐ Request for ante-dating on Form P.4

☐ Request for classification on Form P.9

☐ Request for delay of acceptance on Form P.4

☐ Extra copy of informal drawings (for complete only)

4 ADDRESS FOR SERVICE: Adams & Adams, Pretoria

ted this 3rd day of October 2003

ADAMS & ADAMS  
APPLICANTS PATENT ATTORNEYS

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PRETORIA

FORM P6

REPUBLIC OF SOUTH AFRICA  
Patents Act, 1978

**PROVISIONAL SPECIFICATION**  
(Section 30 (1) - Regulation 27)

21	01	OFFICIAL APPLICATION NO
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22	LODGING DATE
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2003/7748

3 October 2003

71	FULL NAME(S) OF APPLICANT(S)
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INTERNATIONAL TECHNOLOGIES, LLC.

72	FULL NAME(S) OF INVENTOR(S)
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HEINKE, Nils Alberto  
SKAGGS, Roger Dean  
COLLINSWORTH, Stephen Mitchell

54	TITLE OF INVENTION
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BLASTING

5

THIS INVENTION relates to blasting. It relates more specifically to  
 10 blasting of rock or other material by means of a blasting substance charged into  
 a drill hole extending along the rock or other material to be blasted.

For purposes of this invention, the term blasting is to be  
 interpreted widely to cover, generally, destruction of rock or other material by  
 15 means of pressure generating or shock wave generating substances such as  
 explosives, propellants, or the like. Likewise, the term blasting substance is to  
 be interpreted to cover explosives, propellants and other pressure or shock  
 wave generating substances.

20 In accordance with a first aspect of this invention, there is  
 provided a method of charging a drill hole, the method including, in an  
 intermediate portion of the drill hole intermediate a bottom and a mouth of the  
 drill hole,

providing at a relatively low level a lower layer of a blasting substance,  
 25 and a lower layer of a plunger material proximately above the lower layer of  
 blasting substance;

providing at a relatively high level a higher layer of a plunger material, spaced a predetermined distance above said lower layer of plunger material, and proximately above said higher layer of plunger material, a higher layer of a blasting substance;

5 initiators associated with the respective layers of blasting substances and a controller for actuating the initiators at predetermined time intervals.

Said relatively low level may be proximate a bottom of the drill hole and may be spaced above the bottom by a predetermined distance, which  
10 may be between about 0,5 m and about 3 m, advantageously between about 1 m and about 2 m, preferably about 1,5 m, but depending on several factors, such as the depth of the drill hole, the nature of the rock or other material to be blasted, the nature of the plunger material, the nature of the blasting substance, and the like. Likewise, the spacing between said lower layer and said higher  
15 layer of plunger material may be of the same order.

In each case the layer of plunger material and of blasting substance may be supported on a plug capable of being positioned in the drill hole at a predetermined level.

20 The respective layers of plunger material may be flowable material allowing placement in the drill hole at the respective desired positions, e.g., conveniently, drill cuttings.

25 The controller may be adapted to actuate the respective blasting substances simultaneously.

The method may include, by way of development, providing plunger material below the lower layer of blasting substance, providing plunger material above the higher layer of blasting substance, and providing further composite layers of blasting substance neighboured either below or above or both below and above by plunger material, such that a series of such composite layers is provided along the drill hole, with spacings in-between.

The method may include tamping the drill hole proximate its mouth.

10

In accordance with a second aspect of this invention, there is provided a method of blasting a drill hole charged in accordance with the first aspect by actuating the initiators by means of the controller. The initiators may be actuated simultaneously. Actuation may be electrically or electronically.

15

In accordance with a third aspect of this invention, there is provided a method of mining including blasting an array of drill holes, each in accordance with the second aspect of this invention.

20

In accordance with a fourth aspect of this invention, there is provided a charged drill hole, charged in accordance with the first aspect of this invention.

25

In accordance with a fifth aspect of this invention, there is provided a blasting operation, including an array of charged drill holes, each charged in accordance with the first aspect of this invention.

The invention is now described by way of example with reference to the accompanying diagrammatic drawing, which shows, in sectional view, a charged drill hole in accordance with the invention.

5 With reference to the drawing, a charged drill hole in accordance with the invention is generally indicated by reference numeral 10.

10 The drill hole, indicated by reference numeral 12, extends along material, such as rock, to be blasted. The drill hole 12 has an open mouth 14 at a surface of the material to be blasted, and a blind bottom indicated by reference numeral 16. For convenience, it is assumed that the drill hole is a vertical drill hole extending from the mouth 14 downwardly to the bottom.

15 The charged drill hole 10 comprises a lower composite layer generally indicated by reference numeral 20. The position of the lower composite layer 20 is determined by means of a plug 22 which is lodged at a predetermined position in the drill hole 12. The plug 22 is a sacrificial plug and may be any plug suitable for this purpose.

20 In the embodiment illustrated, the lower composite layer 20, and more specifically the plug 22, is at a predetermined spacing, generally indicated by reference numeral 23, above the bottom 16. In this embodiment, the spacing 23 is about 1,5 m.

25 The lower composite layer 20 extends from the position of the plug 22 upwardly. Immediately above the plug 22, supported by, and partially contained within, the plug 22, is provided a layer 24 of plunger material in the



form of drill cuttings. The layer 24, including a portion of the layer 24 contained within the plug 22, is of the order of 150 mm length or thickness, in this embodiment. The reason for selecting the term "plunger material" for the layer 24 and its mechanism of operation, will be described herein below.

5

Immediately above the layer 24, there is provided a layer 26 of an explosive which, in this embodiment, is of the order of 9 m long.

10 Immediately above the layer 26 of explosive, there is provided a further layer of plunger material generally indicated by reference numeral 28. The plunger material 28, in this embodiment, is of the order of about 0,6 m thick or long and it has an upper, free surface 28.1.

15 At a relatively higher level, there is provided a higher composite layer generally indicated by reference numeral 30. The higher composite layer 30 is of generally similar construction than the lower composite layer 20. Furthermore, the higher composite layer 30 is spaced at predetermined spacing 33 above the upper free surface 28.1 in a manner similar to spacing of the lower composite layer 20 above the bottom 16. For convenience, similar  
20 reference numerals have been used for the respective layers or components and they are not again described. The length of the layer 36 of explosive, for the higher composite layer, is of the order of about 6 m.

25 The general arrangement can be repeated as many times as required, depending also on the depth of the drill hole. Generally, all of the composite layers have a more or less central charge of explosives flanked above

and below by a layer of plunger material and each composite layer is based on a plug 22, 23, and the like.

5       Toward the top of the drill hole 12, there is provided a plug 42 supporting a layer of plunger material in the form of drill cuttings indicated by reference numeral 44 and having thereabove a charge of explosives 46. Above the charge of explosives 46, tamping material, for example in the form of hard rock, drill cuttings, or the like is provided indicated by reference numeral 48, and which extends generally to the mouth 14.

10       In each of the layers of explosive, there is provided one or more initiators for actuating the explosive. In this embodiment, the initiators are electric or electronic and are controlled by means of a controller which is not shown.

15       The Applicant does not wish to be bound by theory, but an explanation of the Applicant's hypothesis of the mechanism of operation when the explosives are actuated, is expected to assist a reader's understanding of the invention.

20       Generally, the Applicant expects that it would wish the explosives to be actuated generally simultaneously, but this is not at this stage regarded as of particular importance, and further tests, also depending on various factors, may indicate that time lags may be advantageous.

25       The general hypothesis is based on two aspects. First, it is believed that actuation of an explosive would propel the adjacent material, i.e.

the plunger material, in the nature of a plunger away from the centre of actuation i.e. along a respective spacing, 23, 33, 43, or the like, bearing in mind that such spacing would generally offer the route of least resistance. It is expected that at least the spacings remote from the bottom 16 would consist of air, whereas the spacing 23 adjacent the bottom may consist of air, or water in the case of wet holes, or partially water and partially air.

The second aspect is that the plunger propelled by actuation of the explosive will necessarily impinge on an obstacle and will come to a sudden halt. For example, the layer of plunger material 24 will impinge and come to a halt when it hits the bottom 16, and in the case of the plunger material 28 propelled upwardly when the layer of explosive 26 is actuated, and the plunger material 34 which will be propelled downwardly when the explosive 36 is actuated, they will impinge upon each other to cause the sudden halt.

It is to be appreciated that propelling of the plunger material converts the chemical or potential energy, associated with actuation of the explosive, into or partially into kinetic energy in that the respective layers or masses of plunger material are propelled at high speed. Initial calculations indicate that very high amounts of kinetic energy are involved.

Thus, when the carrier of the kinetic energy (i.e. the mass proceeding at high speed) is forced to a sudden halt, the kinetic energy is again converted into energy associated with pressure or shock wave which causes very effective destruction of rock or other surrounding material, in accordance with preliminary tests conducted by the Applicant.

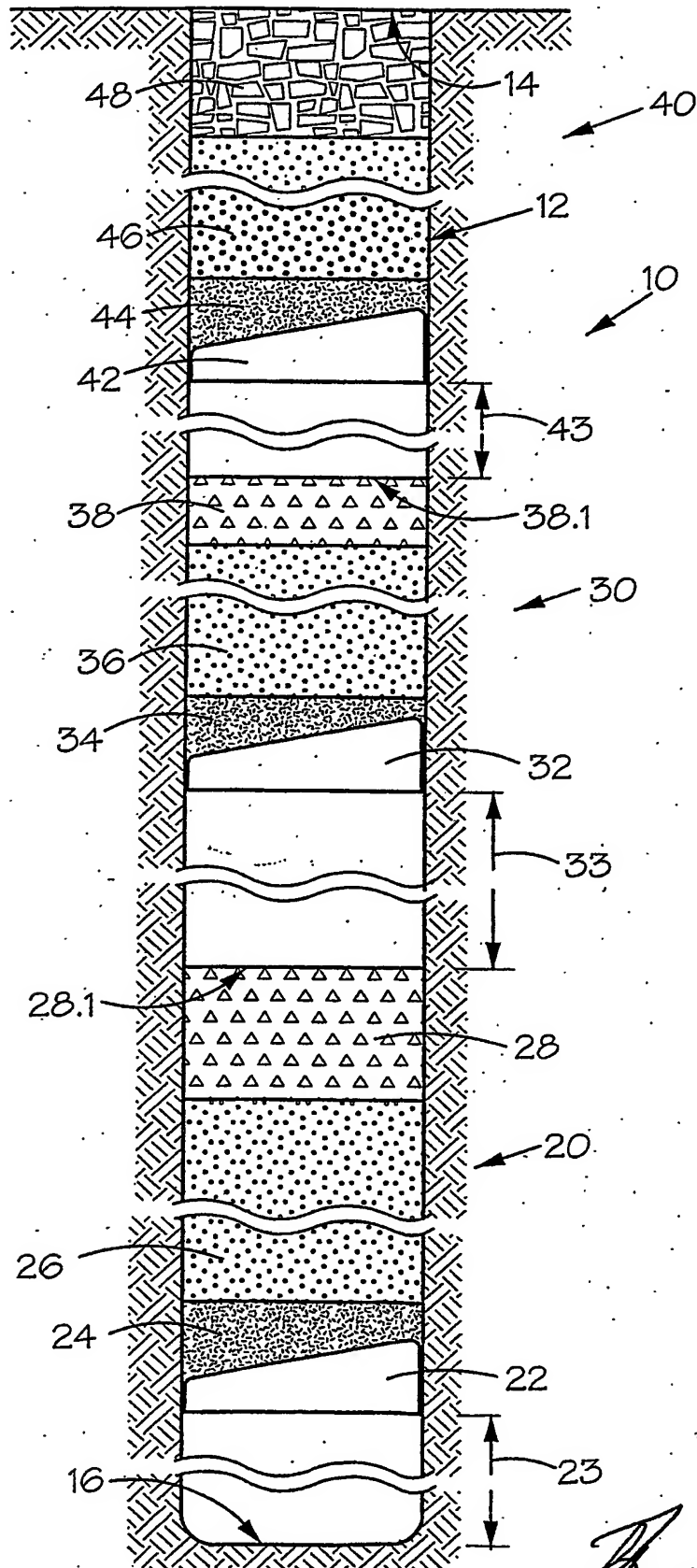
The Applicant believes that this invention has the possibility of greatly reducing the amount of explosives required to conduct blasting operations. This will have the direct effect of a commensurate cost saving in respect of explosives, which makes out a high percentage of the total cost of blasting. It is further expected to have the subsidiary advantages, which may be very important in some applications, of focusing the destructive effort intermediate the bottom 16 of the drill hole and the mouth 14 of the drill hole thus limiting or virtually totally obviating unrequired and sometimes undesired destruction of rock below the bottom 16, and furthermore limits and possibly virtually obviates transfer of energy above the level of the mouth, for example limiting or obviating fly rock, and other undesirable side effects of blasting.

DATED THE 3<sup>rd</sup> DAY OF OCTOBER 2003



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APPLICANT'S PATENT ATTORNEYS



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